

What is Claimed Is:

1. A planetary gear system comprising:
 - a sun gear adapted for rotation about a sun gear axis, the sun gear having a first sun gear part and a second sun gear part, the first sun gear part having first sun helical teeth, the second sun gear part having second sun helical teeth,
 - the first and second sun gear parts being coaxial and welded together such that the sun first and second helical teeth are axially adjacent,
 - a plurality of planet gears adapted for rotation about a corresponding plurality of planet gear axes, each planet gear comprising a first planet gear part and a second planet gear part, the first planet gear part of each planet gear having planet first helical teeth and the second planet gear part of each planet gear having planet second helical teeth,
 - the first and second planet gear parts of each planet gear being coaxial and welded together such that the planet first and second helical teeth are axially adjacent, and
 - the planet first helical teeth of each of the plurality of planet gears meshing with the sun first helical teeth, and the planet second helical teeth of each of the plurality of planet gears meshing with the sun second helical teeth.
2. The planetary gear system of Claim 1 further comprising an apex gap between the first and second parts of the sun gear, and an apex gap between the first and second part of each of the planet gears.
3. The planetary gear system of Claim 1 wherein the sun and planet helical teeth are arranged such that with the sun and planet gears rotating about their respective axes, axial forces imparted by the sun first helical teeth against the planet first helical teeth are in an axial direction opposite the axial forces imparted by the sun second helical teeth against the planet second helical teeth.
4. The planetary gear system of Claim 1 wherein the sun first and second helical teeth are indexed, and the planet first and second helical teeth of each planet gear are indexed.

5. The planetary gear system of Claim 1 wherein the welded sun and planet gears are shaped by Ausform finishing.

6. A double-helical gear comprising a first gear part and a second gear part, said 5 first gear part having first helical teeth, and said second gear part having second helical teeth, said first and second gear parts being coaxial and welded together such that the first and second helical teeth are axially adjacent.

7. The double-helical gear of Claim 6 wherein said gear is a sun gear of a 10 planetary gear system.

8. The double-helical gear of Claim 6 wherein said gear is a planet gear of a planetary gear system.

15 9. The double-helical gear of Claim 6 wherein said first and second helical teeth are indexed.

10. The double-helical gear of Claim 9 further comprising an apex gap between the first and second gear parts.

20 11. A method of forming a double-helical gear, said method comprising the steps of:

providing first and second helical gear parts, said first helical gear part having first helical teeth and said second gear part having second helical teeth, and

25 welding together said first and second parts with said first helical teeth axially adjacent said second helical teeth.

12. The method of Claim 11 further comprising the step of shaping the welded gear using the Ausform finishing process.

13. The method of Claim 11 further comprising the step of shaping the welded gear using the Ausform finishing process without any subsequent grinding of the teeth surfaces.

5 14. The method of Claim 11 further comprising the step of welding together said first and second parts to provide an apex gap between the parts.

15. A method of forming a planetary gear system having one-piece, double-helical sun and planetary gears, said method comprising the steps of:

10 providing a sun gear adapted for rotation about a sun gear axis, the sun gear having a first sun gear part and a second sun gear part, the first sun gear part having first sun helical teeth, the second sun gear part having second sun helical teeth,

welding together the first and second sun gear parts with said parts coaxial and with the sun first and second helical teeth axially adjacent,

15 providing a plurality of planet gears adapted for rotation about a corresponding plurality of planet gear axes, each planet gear comprising a first planet gear part and a second planet gear part, the first planet gear part of each planet gear having planet first helical teeth and the second planet gear part of each planet gear having planet second helical teeth,

20 welding together the first and second planet gear parts of each planet gear with said parts coaxial and with the planet first and second helical teeth axially adjacent, and

meshing the planet first helical teeth of each of the plurality of planet gears with the sun first helical teeth, and meshing the planet second helical teeth of each of the plurality of planet gears with the sun second helical teeth.

25 16. The method of Claim 15 further comprising the step of arranging the sun and planet helical teeth such that with the sun and planet gears rotating about their respective axes, axial forces imparted by the sun first helical teeth against the planet first helical teeth are in an axial direction opposite axial forces imparted by the sun second helical teeth against the planet second helical teeth.

30 17. The method of Claim 16 further comprising the steps of:

providing a ring gear coaxial with the planet gears, the ring gear having a first ring gear part and a second ring gear part, the first ring gear part having ring first helical teeth and the second ring gear part having ring second helical teeth, and

5 meshing the ring first helical teeth with each of the planet first helical teeth
and meshing the ring second helical teeth with each of the planet second helical teeth.

18. The method of Claim 15 further comprising the steps of welding together the first and second sun gear parts to provide an apex gap between the parts, and welding together the first and second planet gear parts to provide an apex gap between the parts.